(19) Patent Office of Japan (JP)(11) Publication of Patent Application

JAPANESE PATENT APPLICATION (KOKAI)(A) 2000-162314
(P2000-162314A)

(43) Publication: Hei-Sei 12 June 16th (2000.6.16)

Int. CL. 5	ID Code	Office Cont'l No.	F1
G 01 S 13/82	Z	3F 022	
B 65 G 1/137	A	5B035	
G 06 K 19/06		5H301	
G 05 D ½	J	5J070	

Verification request: Not requested

Number of claims of the invention: 4 OL

Number of pages (total of 7 pages)

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(21) Filed Number: Application 10-335827

(22) Filed Date: Hei-Sei 10, November 26th (1998.11.26)

(71) Patent Assignee: Mitsubishi Heavy Industries Company

JP 2000-162314

[Note: Names, addresses, company names and brand names are translated in the most common manner. Japanese language does not have singular or plural words unless otherwise specified by a numeral prefix or a general form of plurality suffix.]

(54) [Name of the Invention]

Moving Object Detection Device

(57) [Summary]

[Goal]

The goal of the present invention is to suggest a moving object detection device that does not use a large number of coils and that reliably detects the movement direction of the moving object and together with that can be designed in a small form factor.

[Solution Means]

It is a moving object detection device that detects the direction of movement at the time when a basket cart 3 loaded with loaded items is carried into or out (loaded or unloaded) of the vehicle 1, where on the above described basket cart 3, in advance, an identification tag 5 is attached, where information regarding the loaded objects has been memorized. Also, inside the vehicle 1, for example, the detection coil 20 is attached, which is formed in an asymmetrical shape, for example a triangular shape etc., and together with that a signal processing device, which processes the signal detected by this detection coil 20, is placed. In the case of this signal processing device, at the time when the basket cart 3 is carried in and carried out of the vehicle 1 and it passes by the front surface of the detection coil 20, through the above described coil 20 the information that is recorded in the identification tag 5 is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[Scope of the Claims]

[Claim 1]

Moving object detection device characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle,

That is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory (memorized), a formed in an asymmetric shape detection coil, which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[Claim 2]

Moving object detection device characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle,

That is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory, a detection coil which is formed as a wound wire density roughness and fineness is maintained, and which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[Claim 3]

Moving object detection device characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle,

That is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory, a detection coil that is formed in a curved surface shape, which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[Claim 4]

Moving object detection device according to the reported above Claim paragraphs 1, 2 or 3, characterized by the fact that the above described signal processing device detects and processes the information memorized in the identification tag through the detection coil and together with that it is equipped with a base board and a wireless communication communicating device.

[Detailed Explanation of the Invention]

[0001]

[Technical Field Pertinent to the Present Invention]

The present invention is an invention about a moving object detection device where wireless communication is conducted through a detection coil between an identification tag provided on a basket cart etc., moving object and a signal processing device provided on the vehicle, and the carrying in or carrying out of the vehicle of the above described moving object is identified.

[0002]

[Previous Technology]

For example, if in the case when load items are loaded and transported in a vehicle, for example, a truck etc., if it is possible to automatically detect information specific to the load and unload of the loading items in the vehicle and to the loaded items, it is possible to reliably control the transportation process. At the time when the loading items are loaded or unloaded into the truck, the movement directions of the loading items become opposite. Consequently, if the movement direction of these loading items is detected, it is possible to identify the loading or unloading of the items that are being loaded/unloaded in the vehicle.

[0003]

As such described here above moving object movement direction detection device according to the previous technology, for example, there is the vehicle running direction detection device that has been reported according to the description in the Japanese Patent Application Laid-Open Number Hei-Sei 9-7092. In the case of this vehicle running direction detection device, as it is shown according to Figure 12, it is a device that can detect if a vehicle 40, which is running on the road, is running forward or backward, and because of that on a plane that is parallel to the vehicle running path 45 the coil is separated and arranged in two-dimensions. Regarding the theory of this detection method, as it is shown in Figure 12, the first ~ third coils 41 ~ 43 are placed on the road and the center coil 42 is placed somewhat in downstream direction relative to the two side coils 41 and 43.

[0004]

In the case of such coil arrangement an offset value is defined so that if the vehicle 40 is moving forward as shown by the solid line arrow a shown in Figure 12, and it reaches the initial edges of the coils 41 ~ 43, as shown in Figure 13 (a), the output signals 44 of the three coils 41 ~ 43 rise almost at the same time.

[0005]

Then, if, in the state where the coils 41 ~ 43 are arranged as described here above, the vehicle 40 moves backwards as shown by the broken line arrow b in Figure 12, the vehicle 40 reaches first on the center coil 42 and after that it reaches the coils 41 and 43. As a result from that, the output signals 44 from each of the coils 41 ~ 43 are such that as shown in Figure 13 (b), the output signal 44 of the center coil 42 is most increased, and after that the output signals 44 of the coils 41 and 43 on both sides rise. Through the difference in these output signals 44 the movement direction of the vehicle 40 is detected.

[0006]

[Problems Solved by the Present Invention]

However, in the case of the above described previous technology vehicle running direction detection device, there are the problems points that it is necessary to install in the road multiple coils and together with that it is said that the detection device has a large form factor. Especially, because of the fact that the change of the output signals 44, which accompanies the change of the inductance of the coils 41 ~ 43 through the passing of the vehicle 40, it is necessary that the vehicle 40 passes through close to the coils 41 ~ 43.

[0007]

In the case of the present invention, it is an invention that has been conceived in order to solve the above described problems and because of that it has as a goal to suggest a moving object detection device that does not use a large number of coils and that reliably detects the movement direction of the moving object and together with that can be designed in a small form factor.

[0008]

[Measures in Order to Solve the Problem]

The first invention is characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle, that is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory

(memorized), a formed in an asymmetric shape detection coil, which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[0009]

The second invention is characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle, that is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory, a detection coil which is formed as a wound wire density roughness and fineness is maintained, and which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[0010]

The third invention is characterized by the fact that it is a moving object detection device that detects the carrying in or carrying out of the moving object that is being loaded in a vehicle, that is equipped with an identification tag where predetermined information related to the above described moving object becomes recorded in the memory, a detection coil that is formed in a curved surface shape, which is provided inside the above described vehicle, and a signal processing device, which at the time when the above described moving object is carried in and carried out of the vehicle and it passes by the front surface of the above described detection coil, through the above described coil the information that is recorded in the identification tag is detected and through the asymmetric properties of this output signal waveform, the direction of the carried in or carried out above described moving object is identified.

[0011]

The forth invention is a moving object detection device according to the reported above 1, 2 or 3 inventions, characterized by the fact that the above described signal processing device detects and processes the information memorized in the identification tag through the detection coil and together with that it is equipped with a base board and a wireless communication communicating device.

[0012]

[Conditions of the Practical Implementation of the Present Invention]

Here below, the diagrams are used as reference and the conditions of the practical implementation of the present invention are explained.

[0013]

Figure 1 represents a schematic diagram showing the structure of the whole body of the moving object detection device according to the first practical implementation condition according to the present invention. In Figure 1, in the truck etc., vehicle 1, the basket cart 3 with the loading objects 2 is loaded or unloaded inside the vehicle through the back part using the lift 4. On the above described basket cart 3 the identification tag 5 is attached. On this identification tag 5, through a non-contact card, the different types of information specific to the loading items are memorized. Also, inside the above described vehicle 1, the first detection coil 6 and the second detection coil 7, which read the information define din the identification tag 5 provided on the above described basket cart 3, are set at a predetermined distance. In this case, it is a set up where if the basket cart 3 is loaded inside the vehicle 1, the identification tag 5, which is attached on the basket cart 3, initially passes in front of the first detection coil 6, and subsequently, it passes in front of the second detection coil 7. The above described identification tag 5 receives the power transmitted wave from the first detection coil 6 or the second detection coil 7, and the provided in the internal part IC and memory signal generation device, are started up, and the different types of information are automatically wirelessly communicated in the space between these and the first detection coil 6 or the second detection coil 7.

[0014]

Regarding the above described first and second detection coils 6 and 7, as it is shown according to the presented in Figure 2, for example, they are connected to the signal processing device 8 provided on the driver seat. Especially, to this signal processing device 8, the display device 9, which is provided in the vicinity of the driver seat, is connected and together with that the vehicle antenna 10 provided on the roof of the driver seat, is connected. The above described signal processing device 8 processes the information detected through the above described coil 6 and coil 7 and together with that through the above described vehicle antenna 10, it has wireless communication capability with the base board 11.

[0015]

In the case according to the above described structure, if the basket cart 3 loaded with the loading items 2 is loaded inside the vehicle from the back side of the vehicle 1 as shown by the arrow (solid line) a, the identification tag 5 attached onto the basket cart 3 initially passes in front of the first detection coil 6, and subsequently, it passes in front of the second detection coil 7. At this time the identification tag 5 receives power transmission waves initially from the first detection coil 6 and then from the second detection coil 7,

and the provided in the internal part IC and memory signal generating device are started up and the different types of information related to the loading items 2 are transmitted as signals to the first detection coil 6 and the second detection coil 7. At this time, as it is shown in Figure 3 (a), initially, the signal detected by the first detection coil 6 is output, and after that the signal detected by the second detection coil 7, is output.

[0016]

Also, in the case when the basket cart 3 is unloaded as shown by the arrow (broken line) b, in an order that is opposite to that in the case of the above described loading, namely, initially, the signal detected by the second detection coil 7 is output and after that the signal detected by the first detection coil 6 is output. As described here above, through the order of the detected signals that are output from the first detection coil 6 and the second detection coil 7, it is possible to identify loading or unloading of the basket cart 3 into the vehicle 1.

[0017]

Also, at the time of the loading or unloading of the above described basket cart 3 into the vehicle 1, the different types of information related to the loading items 2 that are recorded in the internal memory of the identification tag 5, through the first detection coil 6 and the second detection coil 7, are forwarded to the signal processing device 8. This signal processing device 8 processes the information that is forwarded from the above described identification tag 5, and the basket cart 3 loading and unloading and the different types of information, are verified, and these are displayed on the display device 9.

[0018]

The information that is processed by the above described signal processing device 8 can communicated wirelessly from the vehicle antenna 10 to the base board 11. The base board 11 verifies the information forwarded from the signal processing device 8 of the vehicle 1 and after that it is recorded and monitored.

[0019]

According to the above described first practical implementation conditions, through the set up where an identification tag 5 is attached onto the basket cart 3 with the loading items 2 and together with that the detection coils 6 and 7 are provided in the vehicle 1, it is possible to verify the loading and unloading of the basket cart 3 into the vehicle and the information regarding the loading items 2, and together with that through the base board 11 the information related to the above described loading items 2 can be confirmed and recorded and by that it is possible to reliably perform the transportation (shipping) control, and also, it is possible to improve the shipping reliability.

[0020]

(Second Practical Implementation Condition)

After that an explanation will be provided regarding the second practical implementation condition according to the present invention. According to the above described first practical implementation condition, a case was shown where symmetric form first coil 6 and second coil 7 were used, however, in the case of the second practical implementation example, as it is shown in Figure 4, for example, one single triangular shaped etc., asymmetric shape detection coil 20 is used and as it is shown according to Figure 5, this detection coil 20 is provided at an appropriate location on the side surface or on the top surface of the vehicle 1. In this case, the detection coil 20 becomes formed asymmetrically relative to the movement direction of the identification tag 5. Moreover, 31 indicates the coil attachment surface.

[0021]

On the other hand, in the basket cart 3, the identification tag 5 is attached.

[0022]

Here, if the basket cart 3 loaded with the loading items 2 is loaded from the back side of the vehicle 1, the basket cart 3 moves in the direction indicated by the arrow (solid line) a, namely, it moves in the forward direction. At this time, the identification tag 5 that is provided on the basket cart 3 also moves in the forward direction and as that is happening as it has been explained here above according to the first practical implementation condition, the automatic wireless communication with the detection coil 20 begins.

[0023]

At this time, the coil 20 is made to be in a triangular shape as it is shown in Figure 4, and because of that if the identification tag 5 moves in the forward direction as it is shown by the arrow (solid line) a, the signal output by the detection coil 20 becomes a waveform, which gradually rises as it is shown according to the solid line 21 in Figure 6, and after that it forms abruptly.

[0024]

Also, in the case when the basket cart 3 is unloaded, the movement of the basket cart 3 becomes in the opposite direction as shown by the arrow (broken line) b in Figure 7, and because of that the signal that is output by the detection coil 20, if looked at with the passing of the time, because of the shape of the coil, becomes a signal that is opposite to the above described signal during the forward movement, and as it is shown by the broken line 22 in Figure 6, it becomes a wave form where the signal in the beginning rises fast and after that it gradually falls. From the difference between these waveforms it becomes possible to verify if the basket cart 3 is loaded or unloaded into the vehicle 1.

[0025]

The signal detected by the above described detection coil 20 is processed by the signal processing device 8 the same way as in the case of the first practical implementation condition and the identification of the basket cart 3 load or unload and the information, are verified and displayed on the display device 9.

[0026]

According to the above described second practical implementation condition, a triangular shape etc., single asymmetric coil 20 is used, and it is possible to detect the load and unload of the basket cart 3 and together with that the different type of information that is output from the identification tag 5 can be verified and the structure is simple and economical.

[0027]

Moreover, as it is shown according to the presented in Figure 11, it is also a good option if the detection coil 20 is wound on the three surfaces of the walls and on the ceiling inside the vehicle 1. When on the walls the single detection coil is placed, a detection is possible independent on the position of the identification tag 5, however, as it is shown according to Figure 11, by placing the detection coil B, the direction of receiving of the wireless signal from the identification tag 5 is increased and because of that the detection range and the detection reliability, are improved. According to Figure 11, a triangular shape detection coil B is placed linearly symmetrically relative to the center of the vehicle 1, however, it is also a good option if a coil that has an asymmetrical shape relative to the center line 50 of the vehicle and that does not require such placement is placed, or if a symmetrically shaped coil is placed intentionally in a position that is not symmetrical relative to the center line 50 of the vehicle. If it can be stated that when looked from the forward direction a or the backward direction b of the movement direction of the identification tag 5, the detection coil shape or wind roughness or fineness become different, the identification of the forward direction a or the backward direction b of the movement direction of the identification tag 5, is possible.

[0028]

(Third Practical Implementation Condition)

After that an explanation will be provided regarding the third practical implementation according to the present invention. Figure 7 (a) ~ (c), represent side view diagrams of the detection coil 20 according to the third practical implementation condition. The relationship between the identification tag 5 at the time when the basket cart 3 is loaded into the vehicle 1 and the coil 20, is the same as that according to the second practical implementation example and shown in Figure 5. Also, the output waveform of the detection coil at the time when the identification tag 5 is moving forward or backward is the same as that according to Figure 6.

[0029]

In the case of this Third practical implementation condition, the detection coil 20 is a single coil as shown according to the presented in Figure 7 (a) ~ (c), and it is a case where the coil wire winding roughness/fineness (relative to the movement direction of the identification tag 5) is maintained. Figure 7 (a) is an example where through screen printing etc., on the same parallel surface the coil wire is formed, and in the same figure (b), it is an example where the coil wire is wound in a concentric parallel surface shape and the center part of the usually used symmetric shape coil is subjected to a tensile force and an eccentric shape is formed. Also, Figure 7 (c) is an example where in a solenoid shape at the same radius it is wound three dimensionally, and this usually used spring shape coil is formed with an eccentricity.

[0030]

As described here above, in the case when the detection coil 20 is used where during the winding of the coil wire the roughness/fineness is maintained, if the basket cart 3 loaded with the loading items 2 is loaded in the vehicle 1 through the back part, because of the fact that the coil wire of the detection coil 20 is wound at uneven density etc., even if the outer shape of the detection coil 20 is symmetric, as the identification tag 5 comes closer to the detection coil 20, depending on the direction, a difference in the detected output signal is detected. For example, if as shown according to Figure 5, a detection coil 20 is placed where the coil wire rough part is facing the left side, namely the bask side of the vehicle, when the identification tag 5 is moving in the forward direction (the direction of the arrow a), together with that the output signal becomes the waveform at the time of the forward movement that is shown by the solid line 21 in Figure 6. On the other hand, in the case when the identification tag 5 is moved in the backward direction (the direction of the arrow b), the signal output from the detection coil 20 becomes the waveform at the time of the backward movement that is shown by the broken line 22 in Figure 6. As a result from that through the output signal from the detection coil 20 it is possible to reliably identify the load, unload direction of the basket 3.

[0031]

According to the above described third practical implementation condition, by the use of a detection coil that is formed as the coil wire wind roughness/fineness is maintained, it is possible to detect the load/unload of the basket cart 3 through a single detection coil and together with that it is possible to verify the different types of information output from the identification tag, and the structure is simpler and extremely economical.

[0032]

(Forth Practical Implementation Condition)

After that an explanation will be provided regarding a forth practical implementation condition according to the present invention. Figure 8 is a side view diagram of the detection coil 20 that detects the position of the identification tag 5 according to the forth practical implementation condition according to the present invention; Figure 9 is a front view diagram of the same detection coil. Also, the relationship between the identification tag 5 at the time when the basket cart 3 is loaded into the vehicle 1 and the coil 20, is the same as that according to the second practical implementation example and shown in Figure 5. Also, the output waveform of the detection coil at the time when the identification tag 5 is moving forward or backward is the same as that according to Figure 6.

[0033]

The point of difference of this forth practical implementation condition relative to the third practical implementation condition, as shown in Figures 8 and 9, is the fact that the detection coil 20 is a coil that is formed in a curved surface shape relative to the movement direction of the identification tag 5. In this case, for example, the curved surface shape coil base board 30 is used and the detection coil 20 is formed in a curved surface shape. Figure 8 and Figure 9 are examples where the coil wire is formed through screen printing etc., however, it is also a good option if the coil wire is formed through a method where it is arranged as in the case according to the third practical implementation condition. Also, in the case of the detection coil 20 according to this forth practical implementation condition, as it is shown in Figure 8, 9, the coil is formed in a horizontal plate shape and after that it is processed so that it becomes a curved surface shape that has a certain regularity, and because of that it is also a good option if the shown according to the first practical implementation condition, second practical implementation condition, third practical implementation condition, different coils and usually used flat plate shaped coils are processed and formed.

[0034]

In the case when curved surface shape detection coil 20 as in the described here above is used, if the basket cart 3 with the loading items 2 is loaded through the back part of the vehicle 1, because of the fact that the detection coil 20 has a curved surface shape, if the identification tag 5 is looked at from the surface where the wireless communication is conducted, even through the detection coil 20 has even coil wire winds, in the horizontal plane, it is seen as if the roughness/fineness is as in the case shown in Figure 7 (a). Consequently, if the identification tag 5 comes close to the detection coil 20 depending on the direction a difference in the detected output signal is generated. For example, in the case shown in Figure 10, if the coil 20 is placed in a state so that it is floating from the right side, namely, the front side of the vehicle 1, from the attachment surface 31 of the detection coil 20, the detected output signal following the movement of the identification tag 5 in the forward direction (arrow a), becomes an output waveform at the time of the forward direction movement as shown by the solid line 21 in Figure 6, and on the other

hand, relative to the movement in the opposite direction (arrow b) it becomes the output waveform at the time of the backward direction movement that is shown by the broken line 22. From this the same way as in the case of the third practical implementation condition, it is possible to reliably identify the load/unload direction of the basket cart 3.

[0035]

According to the above described forth practical implementation condition, by using a detection coil 20 that is formed in a curved surface shape, it is possible to detect the load/unload of the basket cart 3 through a single detection coil and together with that it is possible to verify the different type of information that is output from the identification tag 5 and the structure is even simpler and it is extremely economical.

[0036]

[Results From the Present Invention]

As it has been described here above, according to the first invention an identification tag, which has a predetermined information recorded on it, is attached onto the moving object and together with that inside the vehicle an asymmetrically shaped detection coil is attached, and at the time when the moving object is loaded or unloaded in the vehicle and it passes the front surface of the detection coil, through the above coil the information recorded in the above described identification tag is detected and through the asymmetric properties of the detected signal waveform the load/unload direction of the above described moving object is identified, and because of that by using a single detection coil the movement direction can be reliably detected and it is possible to design a small form factor. In the case according to the second invention, the detection coil is made to have a shape where the coil winding roughness/fineness is maintained and because of that the detected signal waveform of the detected coil becomes asymmetric and by using a single detection coil the movement direction can be reliably detected and it is possible to design a small form factor. In the case of the third invention, it is a detection coil that is formed in a curved surface shape and because of that that the detected signal waveform of the detected coil becomes asymmetric and by using a single detection coil the movement direction can be reliably detected and it is possible to design a small form factor. In the case of the forth invention, the information recorded in the identification tag is detected by the detection coil and processed and together with that a signal processing device, which has a communication means that communicates wirelessly with the baseboard, is provided in the vehicle, and because of that it is possible to communicate to the baseboard and record the information specific to the loaded items and together with that the information about the loading/unloading of the loaded objects into the vehicle and a reliable shipping control can be achieved and together with that it is possible to improve the shipping reliability.

[Brief Description of the Figures]

[Figure 1]

Figure 1 represents a schematic diagram showing the whole structure of the moving object detection device according to the first practical implementation condition according to the present invention.

[Figure 2]

Figure 2 represents a block diagram showing the structure of the essential parts according to the same practical implementation condition.

[Figure 3]

Figure 3 represents a diagram showing the output signal waveform that detects the movement direction of the moving object according to the same practical implementation condition.

[Figure 4]

Figure 4 represents a side view diagram of the detection coil of the moving object detection device according to the second practical implementation condition of the present invention.

[Figure 5]

Figure 5 represents a top view diagram of the relationship between the identification tag, at the time when the basket cart has been loaded inside the vehicle, and the detection coil, according to the same practical implementation condition.

[Figure 6]

Figure 6 is a detection coil output signal waveform diagram at the time when the basket cart is moving in the forward and in the backward direction, according to the same practical implementation condition.

[Figure 7]

Figure 7 (a) ~ (c) is a side view diagram showing correspondingly structural examples of a detection coil according to the third practical implementation condition of the present invention.

[Figure 8]

Figure 8 represents a side view diagram of the detection coil according to the forth practical implementation condition of the present invention.

[Figure 9]

Figure 9 is a front view diagram of the detection coil according to the same practical implementation condition.

[Figure 10]

Figure 10 is a top view diagram of the relationship between the identification tag, at the time when the basket cart has been loaded inside the vehicle, and the detection coil, according to the same practical implementation condition.

[Figure 11]

Figure 11 is a diagram of another structural example according to the second practical implementation condition of the present invention.

[Figure 12]

Figure 12 represents a schematic diagram of the vehicle running direction detection device according to the previous technology.

[Figure 13]

Figure 13 represents a diagram of the detection coil output signal waveform in order to explain the action of the vehicle running direction detection device according to the previous technology.

[Explanation of the Symbols]

1.....vehicle
2.....loading items
3.....basket cart
4.....lift
5.....identification tag
6.....first detection coil
7.....second detection coil
8.....signal processing device
9.....display device
10.....vehicle antenna
11.....baseboard
20.....detection coil
30.....coil baseboard

31.....coil attachment surface

Patent Assignee: Mitsubishi Heavy Industries Company

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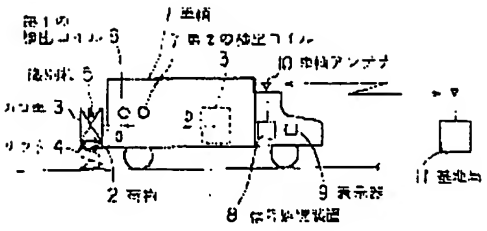
06/29/05

【図1】



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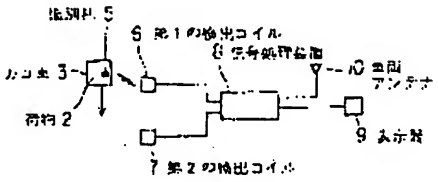

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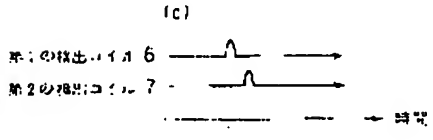

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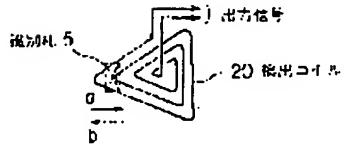

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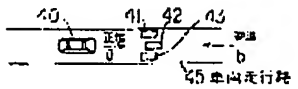

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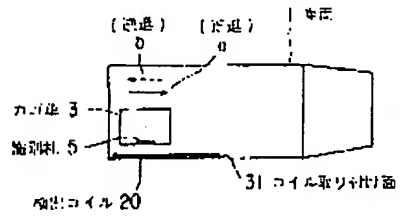
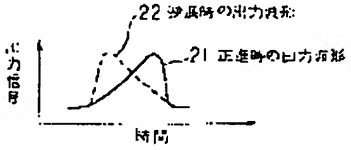


【図6】



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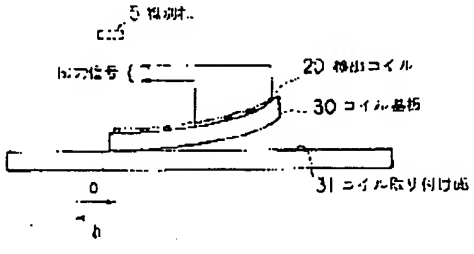

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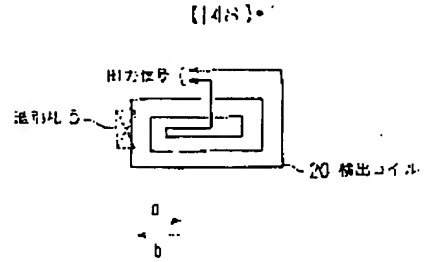

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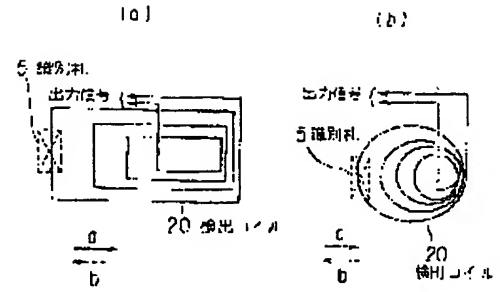

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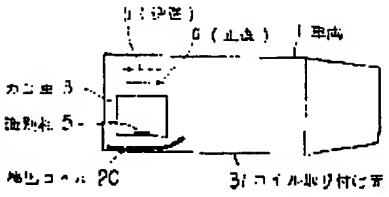

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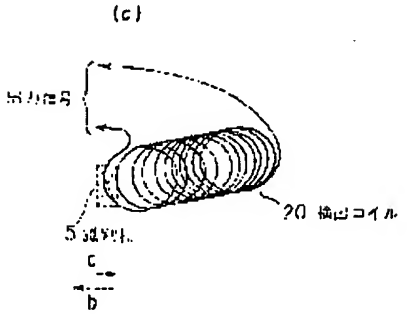

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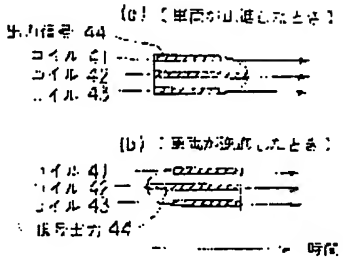

【図11】